FORM PCT 1390 REV. 5/93 — U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NO.
ANWANDER (PCT)

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)
09/830020

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP99/07919	19 OCTOBER 1999	21 OCTOBER 1998

TITLE OF INVENTION
ELECTRIC MACHINE

APPLICANT(S) FOR DO/EO/US
WERNER ANWANDER

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. X This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ___ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. X This is an express request to begin national examination procedures (35 U.S.C. 371 (f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. X A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. X A copy of the International Application as filed (35 U.S.C. 371(c)(2)
   a. X is transmitted herewith (required only if not transmitted by the International Bureau)
   b. ___ has been transmitted by the International Bureau.
   c. ___ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. X A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ___ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. ___ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ___ have been transmitted by the International Bureau.
   c. ___ have not been made; however, the time limit for making such amendments has **NOT** expired.
   d. ___ have not been made and will not be made.
8. ___ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ___ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ___ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ___ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ___ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. X A **FIRST** preliminary amendment.
    ___ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ___ A substitute specification.
15. ___ A change of power of attorney and/or address letter.
16. X Other items or information:

    10 Sheets of Formal Drawings

Applicant Claims Priority under 35 U.S.C. §119 of German Application No. 198 48 503.4 filed October 21, 1998.
Applicant Claims Priority under 35 U.S.C. §120 of: PCT/EP99/07919 filed October 19, 1999.

532 Rec'd PCT/PTO 20 APR 2001

APPLICATION NO. (if known, see 37 CFR 1.5) 09/830020	INTERNATIONAL APPLICATION NO PCT/EP99/07919	ATTORNEY'S DOCKET NO ANWANDER (PCT)

	CALCULATIONS	PTO USE ONLY
X The following fees are submitted:		
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Search Report has been prepared by the EPO or JPO.....**$860.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) **$690.00**		
Neither international preliminary examination fee paid (37 CFR 1.82) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO.....**$1,000.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4).....**$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 860.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ___ 20 ___ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		

Claims	Number Filed	Number Extra	Rate		
Total Claims	34 - 20 =	-14 -	X **$18.00**	$ 252.00	
Independent Claims	1 - 3 =	- 0 -	X **$80.00**	$	
Multiple dependent claim(s) (if applicable)			+ **$270.00**	$	
TOTAL OF ABOVE CALCULATIONS =				$ 1,112.00	
Reduction by 1/2 for Small Entity status.				$ 556.00	
SUBTOTAL =				$ 556.00	
Processing fee of **$130.00** for furnishing the English translation later than ___ 20 ___ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$ 556.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +					
TOTAL FEES ENCLOSED =				$ 556.00	
				Amount to be: refunded	$
				charged	$

X Applicant claims Small Entity status.

a. X A check in the amount of $ 556.00 to cover the above fees is enclosed.

b. ___ Please charge my Deposit Account No. 03-2468 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. X The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 03-2468. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:
COLLARD & ROE, P.C.
1077 Northern Boulevard
Roslyn, New York 11576-1696
(516) 365-9802

Signature

Allison C. Collard
Reg. No. 22,532

Express Mail No. **EL 769 424 462 US**
Date of Deposit April 20, 2001

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10, on the date indicated above, and is addressed to the Ass't. Commissioner for Patents, Washington, D.C. 20231

Lisa L. Vulpis

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS: WERNER ANWANDER (PCT)

PCT NO.: PCT/EP99/07919

FILED: OCTOBER 19, 1999

TITLE: ELECTRIC MACHINE

PRELIMINARY AMENDMENT

BOX PCT
Ass't. Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Preliminary to the initial Office Action, please amend the above-identified application as follows:

IN THE SPECIFICATION:

On Page 1, above line 1, please insert the following paragraphs:

--CROSS REFERENCE TO RELATED APPLICATIONS

Applicant claims priority under 35 U.S.C. §119 of German Application No. 198 48 503.4 filed October 21, 1998. Applicant also claims priority under 35 U.S.C. §120 of PCT/EP99/07919 filed October 19, 1999. The international application under PCT article 21(2) was not published in English.--

IN THE CLAIMS:

Please cancel claims 1-34 and replace them with new claims 35-68 as follows:

--35. Electric machine with a rotor (3, 53) and a stator (7, 57), in which electric coils (6, 56) and permanent magnets (5) are located which influence each other when the rotor revolves, where the rotor (3, 53) contains the magnets (5) and the stator contains the coils (6, 56) and the coils (6, 56) do not have an iron core and at least one section of the coils extends transversely across the circumference of the rotor, wherein the coils (6, 56) are fitted in the stator (7, 57) individually and are bent in such a way that they extend on both sides of the rotor (3, 53) and enclose the magnets (5) located in the rotor to a large extent.

36. Electric machine according to claim 35, wherein the magnets (5) are cylindrical and are located at least approximately tangentially on the circumference of the rotor (3, 53).

37. Electric machine according to claim 35, wherein the permanent magnets (5) are attached to the rotor (3) via support elements (4).

38. Electric machine according to claim 35, wherein the coils (6) have a Ω-shaped cross-section and the magnets (5) are immediately next to the inside of the coils.

39. Electric machine according to claim 35, wherein the support elements (4) for the magnets (5) are attached to the rotor (3) in such a way that they can be replaced.

40. Electric machine according to claim 35, wherein an interlocking facility (73) is provided between the magnets (5) and/or their support elements (4) and the rotor (3), preferably in the radial direction.

41. Electric machine according to claim 35, wherein the magnets (5) and/or their support elements (4) are attached to the rotor (3) so that they can be removed in the axial direction.

42. Electric machine according to claim 35, wherein the connections (8) for the coils (5, 56) are located so that they are accessible individually on the stator (7, 57).

43. Electric machine according to claim 35, wherein the magnets (5) located behind each other have different polarity in each case.

44. Electric machine according to claim 35, wherein a pole reversal device is provided in the supply line to the coils (6, 56).

45. Electric machine according to claim 35, wherein the coil (6, 56) is annular and the profiles of the rotor (3, 5, 53) and the coil are adapted to each other.

46. Electric machine according to claim 35, wherein several rotors (3, 53) and coil configurations are located behind each other in the axial direction of the machine.

47. Electric machine according to claim 35, wherein at least two machines preferably in the form of motors with different diameters are located behind each other on a mutual machine shaft (2, 52).

48. Electric machine according to claim 35, wherein the coils (6) are formed from several coils that are only one wire layer thick in each case.

49. Electric machine according to claim 48, wherein the connections for the individual coils are wired individually and are in particular designed so that they can be connected in series and/or parallel.

50. Electric machine according to claim 48, wherein the individual coil layers are in particular glued together with an adhesive that conducts heat effectively.

51. Electric machine according to claim 35, wherein shielding (9) is provided on the outside of the stator (7) that provides magnetic shielding in particular.

52. Electric machine according to claim 51, wherein the shielding is made from wire (9), particularly a plurality of soft iron wires.

53. Electric machine according to claim 52, wherein the shielding wires (9) are located in concentric circles around the shaft of the machine.

54. Electric machine according to claim 51, wherein the shielding is made from sheet metal, particularly soft iron sheet metal.

55. Electric machine according to claim 35, wherein a cable support (10) is provided on the circumference of the rotor - stator assembly.

56. Electric machine according to claim 35, wherein a housing (12) is provided that encloses the entire rotor - stator assembl

57. Electric machine according to claim 56, wherein the housing (12) has at least one air inlet opening (11) in the immediate vicinity of the machine shaft (2).

58. Electric machine according to claim 56, wherein the housing (12) has at least one air outlet opening at least close to the point where the circumference is largest.

59. Electric machine according to claim 58, wherein the air outlet is connected to the air inlet via a heat exchanger (14, 15) provided between them.

60. Electric machine according to claim 59, wherein the heat exchanger (14) transfers the heat of the machine (111) to a gaseous or liquid medium.

61. Electric machine according to claim 58, wherein the heat exchanger (15) transfers the machine (111) heat to a solid medium and in particular wherein the heat exchanger is designed to be a geothermal heat exchanger (15).

62. Electric machine according to claim 57, wherein a particle filter (16) is provided on the air inlet.

63. Electric machine according to claim 62, wherein the particle filter (16) has at least one fine metallic screen (17, 18).

64. Electric machine according to claim 63, wherein a magnet, particularly a permanent magnet (19), is located with one pole on the fine screen (17).

65. Electric machine according to claim 64, wherein a connection is established between a second fine screen (18) and the second pole of the magnet (19).

66. Electric machine according to claim 64, wherein the fine screens (17, 18) are configured in such a way that they can be separated from the magnet (19).

67. Electric machine according to claim 62, wherein a filter (16) is provided that is able to filter particles out of the flow of air that can be influenced electrically and/or magnetically.

68. Electric machine according to claim 56, wherein the housing (12) is designed in such a way that effective heat transmission is guaranteed between the housing (12) and the surroundings.--

REMARKS

By this Preliminary Amendment, the application has been amended to conform with U.S. practice, the cross-reference to related applications has been inserted on page 1 and claims 1-34 have been replaced by new claims 35-68. No new matter has been introduced. Entry of this amendment is respectfully requested.

Respectfully submitted,

WERNER ANWANDER (PCT)

Allison C. Collard, Reg. No. 22,532
Edward R. Freedman, Reg. No. 26,048
Attorneys for Applicants

COLLARD & ROE, P.C.
1077 Northern Boulevard
Roslyn, New York 11576
(516) 365-9802
acc:jc

An02PCT W.Anwander

Description

Electric machine

Electric machine with a rotor and a stator, in which electric coils and permanent magnets are located which influence each other when the rotor revolves, where the rotor contains the magnets and the stator contains the coils and the coils do not have an iron core and at least one section of the coils extends transversely across the circumference of the rotor.

A machine of this kind has already been disclosed in EP-B-0 422 539.

The purpose of the invention is to improve this machine.

In the solution to this problem proposed by the invention, the coils are fitted in the stator individually and are bent in such a way that they extend on both sides of the rotor and enclose the magnets located in the rotor to a large extent.

The fact that the magnets are enclosed by the individual coils leads to the achievement of a very high degree of efficiency, while both production and maintenance are simplified considerably by the provision of individual coils.

In accordance with an advantageous development of the invention, it is provided that the magnets are cylindrical and are located at least approximately tangentially on the circumference of the rotor.

This configuration makes it simple to adjust the magnets and the coils.

In another advantageous development of the invention, the permanent magnets are attached to the rotor via support elements.

This has the effect that the magnets can be replaced easily if this is required.

It is also very advantageous if in accordance with a further development of the invention the coils have a Ω-shaped cross-section and the magnets are immediately next to the inside of the coils.

A particularly high degree of machine efficiency is reached as a result.

In another advantageous development of the invention, the support elements for the magnets are attached to the rotor in such a way that they can be replaced.

This makes it particularly easy to remove the magnets from the machine and to fit them back on it again.

It has also proved to be particularly advantageous if an interlocking facility is provided between the magnets and/or their support elements and the rotor, preferably in the radial direction.

A secure connection is established between the magnet and/or support element and the rotor as a result. High centrifugal forces that are produced are compensated for effectively.

It is also very advantageous if the magnets and/or their support elements are attached to the rotor so that they can be removed in the axial direction.

This guarantees that the magnets are simple to remove from the rotor.

It is also very advantageous if in accordance with a further development of the invention the connections for the coil are located so that they are accessible individually on the stator.

This makes it simple to check every individual coil if a fault occurs.

It has proved to be very advantageous if in accordance with a further development of the invention the magnets located behind each other have different polarity in each case.

The machine achieves a particularly high power yield as a result.

It is also particularly favourable if in accordance with a further development of the invention a pole reversal device is provided in the supply line to the coils.

As a result of this, the electric machine can on the one hand be operated with direct current voltage before the pole reversal device and with alternating current voltage after the pole reversal device when it is used as a motor, while alternating current voltage can on the other hand be tapped before the pole reversal device and direct current voltage can be tapped after the pole reversal device when the electric machine is used as a generator.

It has proved to be very favourable if in accordance with a further development of the invention the coil is annular and the profiles of the rotor and coil are adapted to each other.

A further advantageous development of the invention is characterised by the fact that several rotors and coil configurations are located behind each other in the axial direction of the machine.

It is also very favourable if in accordance with a further development of the invention at least two machines preferably in the form of motors with different diameters are located behind each other on a mutual machine shaft.

The different diameters mean that the motors have different torques, which can be very advantageous when the machine starts up in particular.

It has also proved to be extremely advantageous if the coils are formed from several coils that are only one wire layer thick in each case.

Easier and more precise shaping of the coils is possible as a result.

It is very advantageous in this context if the connections for the individual coils are wired individually and are in particular designed so that they can be connected in series and/or parallel.

It has also proved to be very advantageous if the individual coil layers are in particular glued together with an adhesive that conducts heat effectively.

This construction guarantees optimum coil design and good heat dissipation.

In a further advantageous development of the invention, shielding is provided on the outside of the stator that provides magnetic shielding in particular.

It is very advantageous in this context if the shielding is made from wire, particularly a plurality of soft iron wires.

It is also very advantageous in this context if the shielding wires are located in concentric circles around the shaft of the machine.

It has also proved to be advantageous if the shielding is made from sheet metal, particularly soft iron sheet metal.

Shielding the stator against magnetic and electric fields that act outwards reduces the effect on other machines in the surrounding area considerably.

In accordance with another development of the invention, it is very advantageous if a cable support is provided on the circumference of the rotor – stator assembly.

Tidy and simple cable guidance between the coils and out of the machine is guaranteed in this way.

In another very advantageous development of the invention, a housing is provided that encloses the entire rotor – stator assembly.

This on the one hand provides protection against contact, while it on the other hand effectively keeps dirt etc. away from the electric machine.

It is advantageous in this context if the housing has at least one air inlet opening in the immediate vicinity of the machine shaft.

It is also very advantageous in this context if the housing has at least one air outlet opening at least close to the point where the circumference is largest.

The air sucked in through the air inlet opening is accelerated towards where the rotor circumference is largest by the rotary movement of the rotor and leaves the housing via the air outlet opening. The machine is cooled effectively as a result. Optimum flow over and around the coils is guaranteed as a result.

In a further advantageous development of the invention, the air outlet is connected to the air inlet via a heat exchanger provided between them.

This is an effective way to remove the waste heat of the machine and possibly to use it for another purpose.

It has proved to be very advantageous in this context if the heat exchanger transfers the heat of the machine to a gaseous or liquid medium.

It is also very advantageous if the heat exchanger transfers the machine heat to a solid medium and in particular if the heat exchanger is designed to be a geothermal heat exchanger.

It is extremely advantageous if in accordance with a further development of the invention a particle filter is provided on the air inlet.

Particles that are harmful to the machine are kept away from the inside of the housing as a result.

It has proved to be advantageous in this context if the particle filter has at least one fine metallic screen.

This guarantees that the fine screen can be cleaned and reused even when it has become very dirty.

It is in addition extremely advantageous if a magnet, particularly a permanent magnet, is located with one pole on the fine screen.

This is an effective way to keep out magnetic particles that could have the greatest impact on the machine.

It is very advantageous in this context if a connection is established between a second fine screen and the second pole of the magnet.

Any magnetic particles that manage to get through the first fine screen nevertheless are as a result stopped by the second fine screen.

It is also extremely advantageous if the fine screens are configured in such a way that they can be separated from the magnet.

The particles that have been caught are particularly easy to remove from the fine screen(s) after they have been separated from the magnet.

In another advantageous development of the invention, a filter is provided that is able to filter particles out of the flow of air that can be influenced electrically and/or magnetically.

Electrically charged particles that have a negative effect on the machine can also be kept out of the inside of the housing as a result.

In another advantageous development of the machine, the housing is designed in such a way that effective heat transmission is guaranteed between the housing and the surroundings.

This enables the machine to be operated without any danger of overheating even when it is completely enclosed.

Several different embodiments of the invention are illustrated in the drawings:

Fig.1 is a cross-section of a machine with cylindrical magnets and Ω-shaped coils,

Fig.2 is a side view of the machine showing the stator,

Fig.3 is a side view of the rotor with permanent magnets that are arranged to permit their removal,

Fig.4 is a side view of a machine that has been disassembled to some extent,

Fig.5 is a cross-section of another machine,

Fig.6 is a side view of the machine shown in Fig. 5,

Fig.7 is a side view of a magnet interlocked with the rotor,

Fig.8 is a tangential view of the rotor with the same interlocked magnet,

Fig.9 is a partial side view of a stator, that is covered on the outside with concentric rings made of wire,

Fig.10 is a cross-section of another machine, which on the one hand has wire rings as shown in Fig. 9, while a cable support is located above the stator,

Fig.11 shows a machine enclosed in a housing, with a heat exchanger to remove the waste heat of the machine,

Fig.12 shows a further machine enclosed in a housing, with a geothermal heat exchanger to remove the waste heat of the machine,

Fig.13 shows another machine enclosed in a housing, with air inlet openings protected by filters and with a discharge air duct and

Fig.14 is a cross-section of a filter assembly with two fine screens and a permanent magnet.

1 in Fig. 1 is a machine that can be used either as a motor or as a generator. A rotor 3 to which support elements 4 are attached is located on a shaft 2. Cylindrical permanent magnets 5 are provided on the outer end of these support elements 4. These permanent magnets 5 are surrounded by Ω-shaped coils 6 leaving a small air gap between them, the coils 6 in turn being fixed in the stator section 7.

A side view of the stator 7 is shown in Fig. 2, where four coils 6 are provided. The connection lines 8 for the coils 6 have been wired outwards, so that the coils 6 can be checked without the need for any dismantling if a fault occurs.

As is shown in the two Figures 3 and 4, not only the permanent magnets 5 together with their support elements 4 but also the coils can be removed easily

and can be refitted just as easily. Only the part concerned therefore has to be replaced in each case when repairs are needed.

In the embodiment shown in Figures 5 and 6, the shaft 52 of the machine 51 supports a rotor 53 with a larger diameter, to which the permanent magnets 5 are attached directly. Since the permanent magnets are difficult to fit and remove in this configuration, the coils 56 have a U-shaped cross-section. When appropriate covers have been taken off the stator housing, the coils 56 can be removed easily. The coil connections 8 are provided on the outside here too so that checks are simple to make.

Fig. 7 shows a rotor 71 with openings 72, the radial sides 73 of which dovetail outwards. Permanent magnets 5, the shape of which corresponds to the shape of the openings 72, are fitted in these openings from the axial direction. The permanent magnets 5 are attached in the axial direction by screws 74 that are shown in Fig. 8 and that engage holes 75 drilled at the places where the openings 72 are widest. The permanent magnets 5 are held securely in the radial direction due to the dovetailed interlocking of the permanent magnets 5 with the rotor 71. The centrifugal forces that are produced in the radial direction during operation and act on the permanent magnets 5 are compensated for in this way. It needs to be easy for the permanent magnets 5 to be removed in the axial direction, so they are only attached by two screws 74, as a result of which the magnets 5 are simple to replace.

In order to minimise undesirable effects on the environment due to the permanent magnets 5 rotating in the machine 1, concentric rings 9 made of insulated wire are provided on the outside of the stator 7 and outside the coils 6, as is shown in Fig. 9. The magnetic alternating fields of the rotating permanent magnets 5 generate currents in the rings 9 that are converted into heat.

A cable support 10, that is provided to accommodate the connection lines 8 which lead away from the coils 6, is located in the radial direction outside the stator 7 and the rotor 3 in Fig. 10. Air inlet openings 11 are in addition located close to the shaft 2, through which cooling air is supplied to the machine 1. This cooling air is transported radially outwards by the rotary movement of the rotor, as a result of which the entire machine 1, including the coils 6, the shielding rings 9 and the connection lines 8 are cooled.

The machine 111 that is shown in Fig. 11 is surrounded completely by a housing 12. A discharge air duct 13, which leads to the air inlet opening 11 via a heat exchanger 14, is located where the housing 12 is radially widest. This means that the machine 111 is cooled by a self-contained air circulation system, so that no contaminants can get inside the machine housing 12 via the cooling system. This machine 111 can therefore be used even under extreme conditions. The waste heat is removed by the heat exchanger 14 via a duct system that is not shown in any detail in the drawing using a gaseous or liquid medium. Another conceivable possibility in this context is to take advantage of the latent heat of a medium in the heat exchanger 14. It is also possible to use a geothermal heat exchanger 15 to remove the waste heat of the machine 111. The waste heat of the machine 111 is then fed into a solid medium such as a cool layer of earth.

Filters 16 that filter out particles which would be harmful to the machine 131 are provided on the air inlet openings 11 of the housing 12 to filter the air supplied to an open cooling air system of another machine 131. The filters 16 consist essentially of two fine metallic screens 17 and 18, each of which is connected to one pole of a permanent magnet 19. Due to the magnetism of the permanent magnet 19, magnetic particles that could pass through the fine screens 17 and 18 because they are smaller than the mesh in them are attracted magnetically to the fine screens 17 and 18. The fine screens 17 and 18 are designed in such a way

that they can be separated from the permanent magnet 19, as a result of which it is simple to clean off the magnetic particles that have settled on them.

An02PCT W.Anwander

Claims

1. Electric machine with a rotor (3, 53) and a stator (7, 57), in which electric coils (6, 56) and permanent magnets (5) are located which influence each other when the rotor revolves, where the rotor (3, 53) contains the magnets (5) and the stator contains the coils (6, 56) and the coils (6, 56) do not have an iron core and at least one section of the coils extends transversely across the circumference of the rotor, **wherein** the coils (6, 56) are fitted in the stator (7, 57) individually and are bent in such a way that they extend on both sides of the rotor (3, 53) and enclose the magnets (5) located in the rotor to a large extent.

2. Electric machine according to claim 1, **wherein** the magnets (5) are cylindrical and are located at least approximately tangentially on the circumference of the rotor (3, 53).

3. Electric machine according to claim 1 or 2, **wherein** the permanent magnets (5) are attached to the rotor (3) via support elements (4).

4. Electric machine according to one of the previous claims, **wherein** the coils (6) have a Ω-shaped cross-section and the magnets (5) are immediately next to the inside of the coils.

5. Electric machine according to one of the previous claims, **wherein** the support elements (4) for the magnets (5) are attached to the rotor (3) in such a way that they can be replaced.

6. Electric machine according to one of the previous claims, **wherein** an interlocking facility (73) is provided between the magnets (5) and/or their support elements (4) and the rotor (3), preferably in the radial direction.

7. Electric machine according to one of the previous claims, **wherein** the magnets (5) and/or their support elements (4) are attached to the rotor (3) so that they can be removed in the axial direction.

8. Electric machine according to one of the previous claims, **wherein** the connections (8) for the coils (5, 56) are located so that they are accessible individually on the stator (7, 57).

9. Electric machine according to one of the previous claims, **wherein** the magnets (5) located behind each other have different polarity in each case.

10. Electric machine according to one of the previous claims, **wherein** a pole reversal device is provided in the supply line to the coils (6, 56).

11. Electric machine according to one of the previous claims, **wherein** the coil (6, 56) is annular and the profiles of the rotor (3, 5, 53) and the coil are adapted to each other.

12. Electric machine according to one of the previous claims, **wherein** several rotors (3, 53) and coil configurations are located behind each other in the axial direction of the machine.

13. Electric machine according to one of the previous claims, **wherein** at least two machines preferably in the form of motors with different diameters are located behind each other on a mutual machine shaft (2, 52).

14. Electric machine according to one of the previous claims, **wherein** the coils (6) are formed from several coils that are only one wire layer thick in each case.

15. Electric machine according to claim 14, **wherein** the connections for the individual coils are wired individually and are in particular designed so that they can be connected in series and/or parallel.

16. Electric machine according to claim 14 or 15, **wherein** the individual coil layers are in particular glued together with an adhesive that conducts heat effectively.

17. Electric machine according to one of the previous claims, **wherein** shielding (9) is provided on the outside of the stator (7) that provides magnetic shielding in particular.

18. Electric machine according to claim 17, **wherein** the shielding is made from wire (9), particularly a plurality of soft iron wires.

19. Electric machine according to claim 18, **wherein** the shielding wires (9) are located in concentric circles around the shaft of the machine.

20. Electric machine according to claim 17, 18 or 19, **wherein** the shielding is made from sheet metal, particularly soft iron sheet metal.

21. Electric machine according to one of the previous claims, **wherein** a cable support (10) is provided on the circumference of the rotor – stator assembly.

22. Electric machine according to one of the previous claims, **wherein** a housing (12) is provided that encloses the entire rotor – stator assembly.

23. Electric machine according to claim 22, **wherein** the housing (12) has at least one air inlet opening (11) in the immediate vicinity of the machine shaft (2).

24. Electric machine according to claim 22 or 23, **wherein** the housing (12) has at least one air outlet opening at least close to the point where the circumference is largest.

25. Electric machine according to claim 24, **wherein** the air outlet is connected to the air inlet via a heat exchanger (14, 15) provided between them.

26. Electric machine according to claim 25, **wherein** the heat exchanger (14) transfers the heat of the machine (111) to a gaseous or liquid medium.

27. Electric machine according to claim 24, **wherein** the heat exchanger (15) transfers the machine (111) heat to a solid medium and in particular **wherein** the heat exchanger is designed to be a geothermal heat exchanger (15).

28. Electric machine according to one of claims 23 to 27, **wherein** a particle filter (16) is provided on the air inlet.

29. Electric machine according to claim 28, **wherein** the particle filter (16) has at least one fine metallic screen (17, 18).

30. Electric machine according to claim 29, **wherein** a magnet, particularly a permanent magnet (19), is located with one pole on the fine screen (17).

31. Electric machine according to claim 30, **wherein** a connection is established between a second fine screen (18) and the second pole of the magnet (19).

32. Electric machine according to one of the claims 30 or 31, **wherein** the fine screens (17, 18) are configured in such a way that they can be separated from the magnet (19).

33. Electric machine according to one of the claims 28 to 32, **wherein** a filter (16) is provided that is able to filter particles out of the flow of air that can be influenced electrically and/or magnetically.

34. Electric machine according to claim 22, **wherein** the housing (12) is designed in such a way that effective heat transmission is guaranteed between the housing (12) and the surroundings.

An02DE W.Anwander

Summary

Electric machine

Electric machine with a rotor (3, 53) and a stator (7, 57), in which electric coils (6, 56) and permanent magnets (5) are located which influence each other when the rotor revolves, where the rotor (3, 53) contains the magnets (5) and the stator contains the coils (6, 56) and the coils (6, 56) do not have an iron core and at least one section of the coils extends transversely across the circumference of the rotor, where the coils (6, 56) are fitted in the stator (7, 57) individually and are bent in such a way that they extend on both sides of the rotor (3, 53) and enclose the magnets (5) located in the rotor to a large extent.

Fig.1

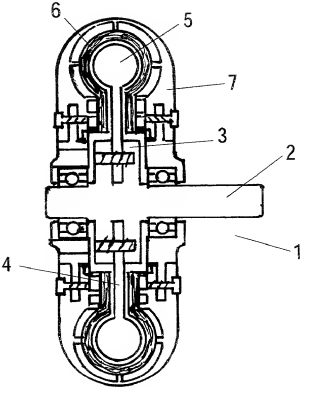

Fig. 1

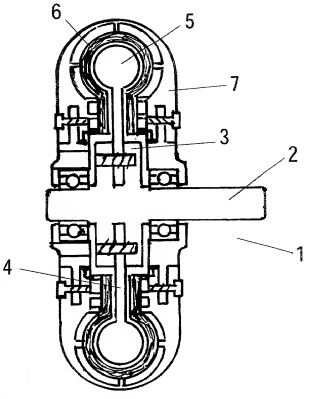

Fig. 1

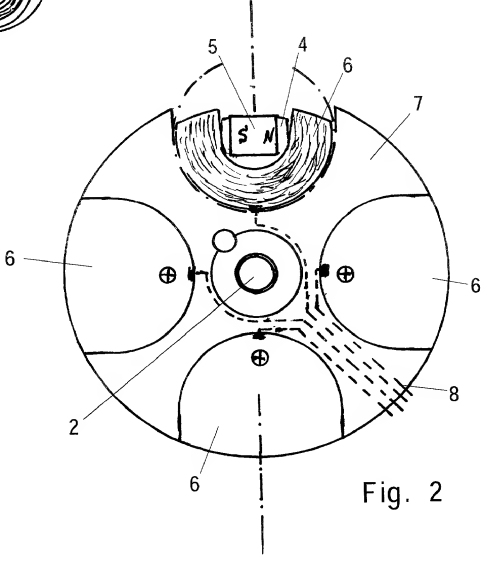

Fig. 2

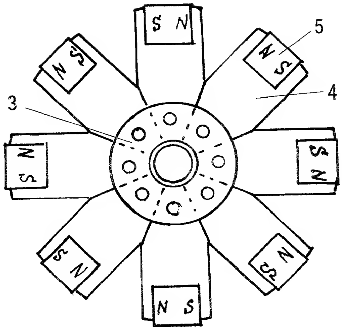

Fig. 3

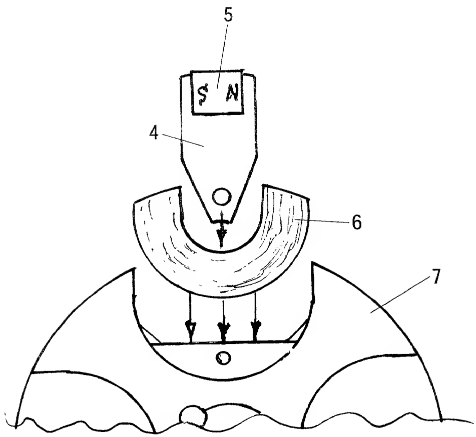

Fig. 4

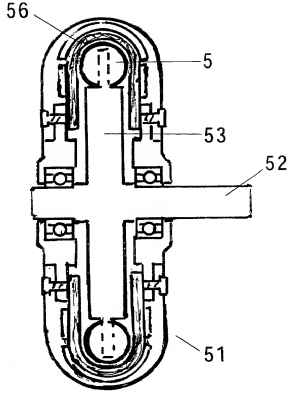

Fig. 5

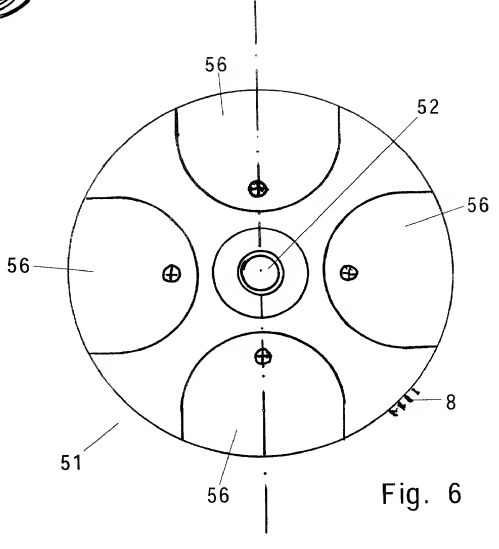

Fig. 6

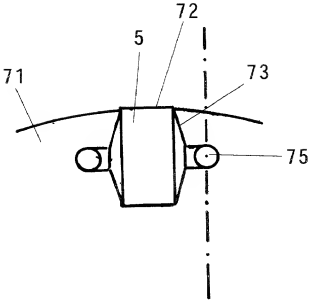

Fig. 7

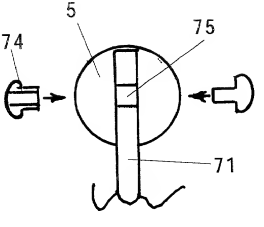

Fig. 8

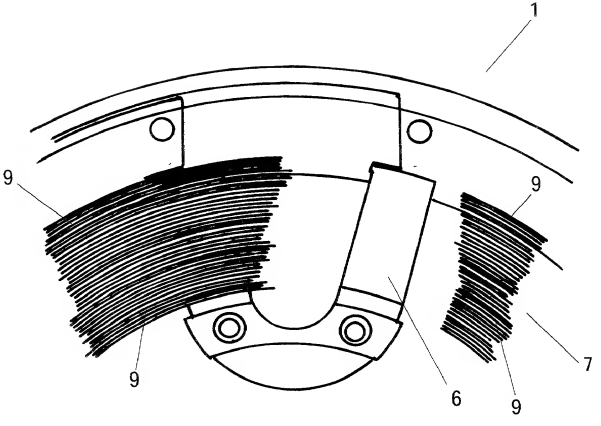

Fig. 9

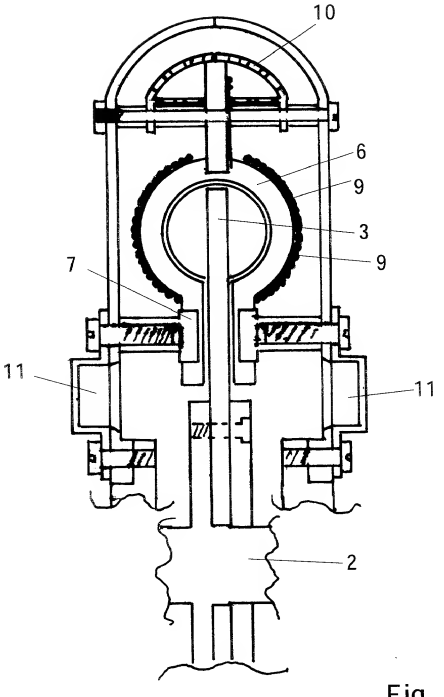

Fig. 10

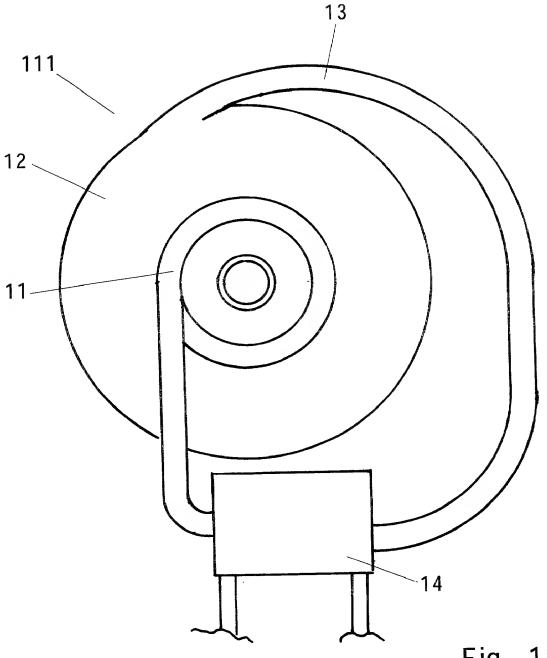

Fig. 11

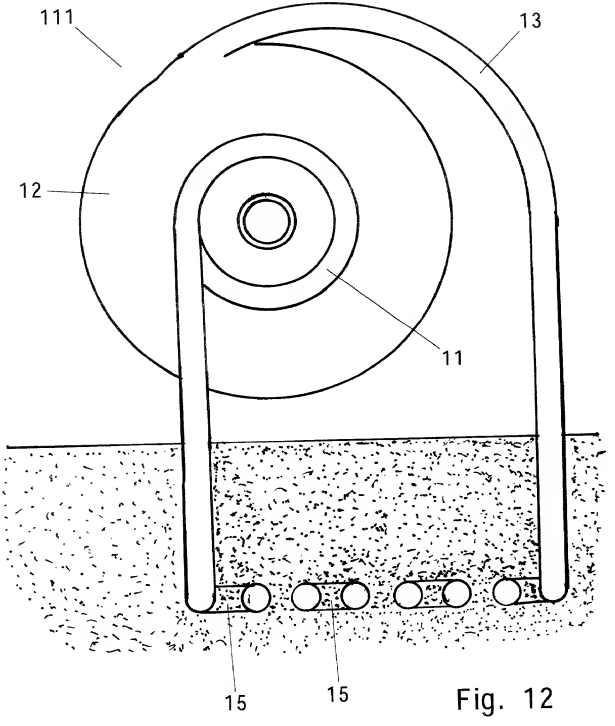

Fig. 12

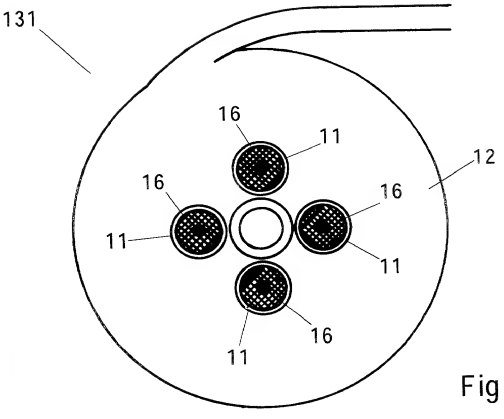

Fig. 13

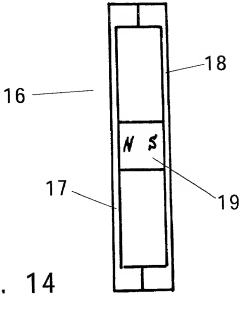

Fig. 14

COMBINED DECLARATION FOR P/ (Includes Reference to PCT International A_ 516 365 9805 WER OF ATTORNEY

ATTORNEY'S DOCKET NUMBER
ANWANDER-PCT

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ELECTRIC MACHINE

the specification of which (check only one item below):

[ ] is attached hereto.

[ ] was filed as United States application

Serial No. _____

on _____,

and was amended

on _____ (if applicable).

[X] was filed as PCT international application

Number PCT/EP99/07919

on 19 OCTOBER 1999,

and was amended under PCT Article 19

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY (if PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
GERMANY	198 48 503.4	21 OCTOBER 1998	[X] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO

COMBINED DECLARATION FOR P/ (Includes Reference to PCT International Ap...) 516 365 9805 WER OF ATTORNEY

ATTORNEY'S DOCKET NUMBER ANWANDER-PCT

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application Number) (Filing Date)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclose in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (Check One)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)			

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration numbers):

ALLISON C. COLLARD, Registration No. 22,532;
EDWARD R. FREEDMAN, Registration No. 26,048;
ELIZABETH COLLARD RICHTER, Registration No. 35,103
KURT KELMAN, Registration No. 18,628
WILLIAM C. COLLARD, Registration No. 38,411
FREDERICK J. DORCHAK, Registration No. 29,298
REINE H. GLANZ, Registration No. 46,728

Send Correspondence to: COLLARD & ROE, P.C. 1077 Northern Boulevard Roslyn, New York 11576

Customer No. 25889

Direct Telephone Calls to: *(name and telephone number)* (516) 365-9802

	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
2		ANWANDER	WERNER	
0	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
		OY-MITTELBERG	GERMANY DEX	GERMANY
1	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
		BIRKENWEG 2	D-87466 OY-MITTELBERG	GERMANY

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201	SIGNATURE OF INVENTOR 202
Werner Anwander	
DATE 30. April 2001	DATE